

Lilly Teaching Fellows 25th Anniversary Reflections



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SoTL @ MSU

Early Years – 1991 – 1993

Formative Years – 1993 – 2003

Recent – 2003 – present

Future –

Michigan State University

April 28, 2016



1991
National Lilly Teaching Fellows
Meeting
Indianapolis, IN



Process Metallurgy Research at Interfaces

- Dissolution Kinetics – liquid-solid interface
- Iron Ore Desliming – solid-solid interface
- Metal-oxide reduction roasting – gas-solid interface

Dissolution Kinetics

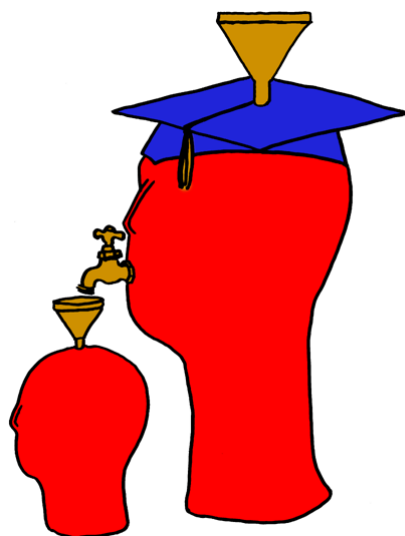
- Theory – Governing Equation for Mass Transport
- Research – rotating disk
- Practice – leaching of silver bearing metallic copper & printed circuit-board waste

$$(\nabla c \bullet \underline{v}) = D \nabla^2 c$$

$$v_y \frac{dc}{dy} = D \frac{d^2c}{dy^2}$$

First Teaching Experience

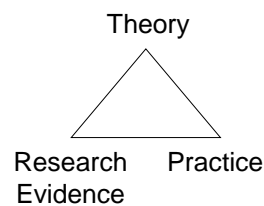
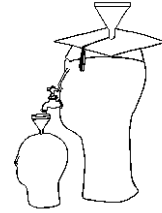
- Practice – Third-year course in metallurgical reactions – thermodynamics and kinetics



Lila M. Smith

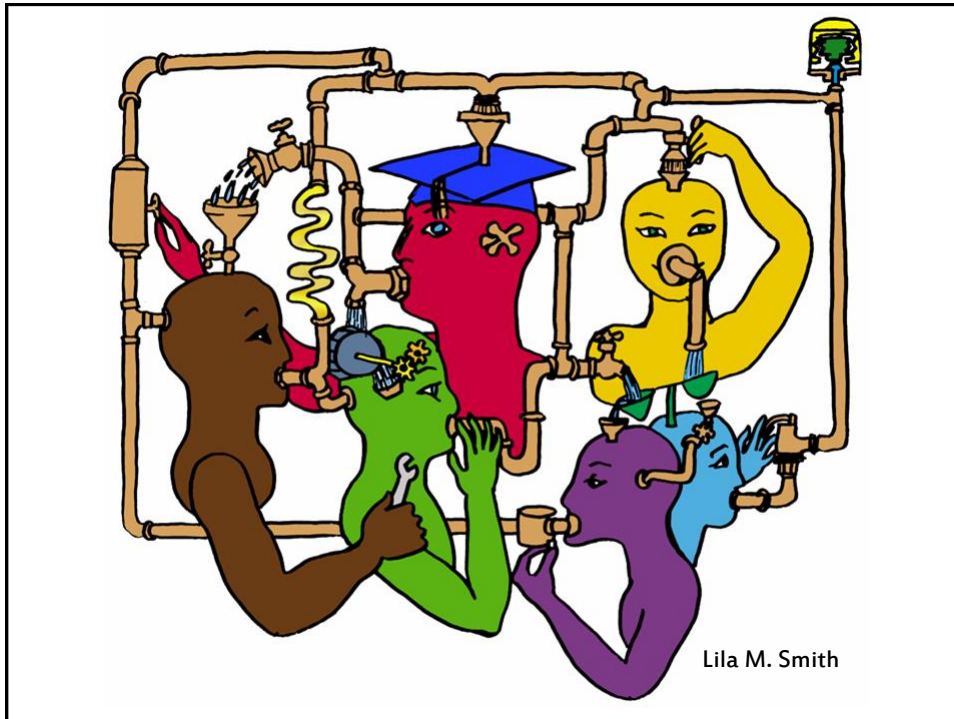
Engineering Education

- Practice – Third-year course in metallurgical reactions – thermodynamics and kinetics
- Research – ?
- Theory – ?



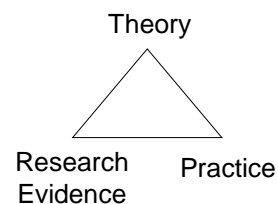
University of Minnesota College of Education Social, Psychological and Philosophical Foundations of Education

- Statistics, Measurement, Research Methodology
- Assessment and Evaluation
- Learning and Cognitive Psychology
- Knowledge Acquisition, Artificial Intelligence, Expert Systems
- Development Theories
- Motivation Theories
- Social psychology of learning – student – student interaction



Cooperative Learning

- Theory – Social Interdependence – Lewin – Deutsch – Johnson & Johnson
- Research – Randomized Design Field Experiments
- Practice – Formal Teams/Professor's Role



Cooperative Learning is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete final outcome).

Key Concepts

- Positive Interdependence
- Individual and Group Accountability
- Face-to-Face Promotive Interaction
- Teamwork Skills
- Group Processing

Cooperative Learning	
Positive Interdependence Goal Interdependence essential: 1. All members share resources 2. All members improve 3. All group members agree to get personal group score 4. One student from group that all helped with and can explain Role Interdependence Assign each member a role and rotate them Resource Interdependence 1. Limit resources (one set of materials) 2. Rotate materials 3. Separate contributions Task Interdependence 1. Task too large 2. Clear direction Outside Challenge Interdependence 1. Challenge competition 2. Other class competition Identity Interdependence Mutual identity (names, motto, etc.) Instrumental Interdependence 1. Designated classroom space 2. Classroom special meeting place Tutoring Interdependence Reciprocal interdependence in chapters ("You are a scientist/factory worker team, find on the movie, etc.") Reward/Calculation Interdependence 1. Calculate points earned 2. Bonus points (one with each) 3. Single group grade (each has to all)	Individual Accountability Ways to ensure no shirkers: • Assign group size small (2-4) • Assign roles • Randomly ask one member of the group to explain the material • Have students do work before group meets • Have students use their group meeting to do an individual task afterward • Randomly assign 1 participant 1 sign, and 1 can explain • Observe & record individual contributions Ways to ensure that all members learn: • Practice task • Tell each other's work and sign agreement • Randomly check one paper from each group • Give individual test • Assign the role of checker who has each group member explain test load • Encourage explaining each student explains their learning to a new partner Face-to-Face Interaction Structure: • Time for groups to meet • Group members come together • Small group size of two or three • Random seat assignment • Strong positive interdependence • Communication made about learning • Positive social skill use • Contributions for encouragement, advice, help, and resources

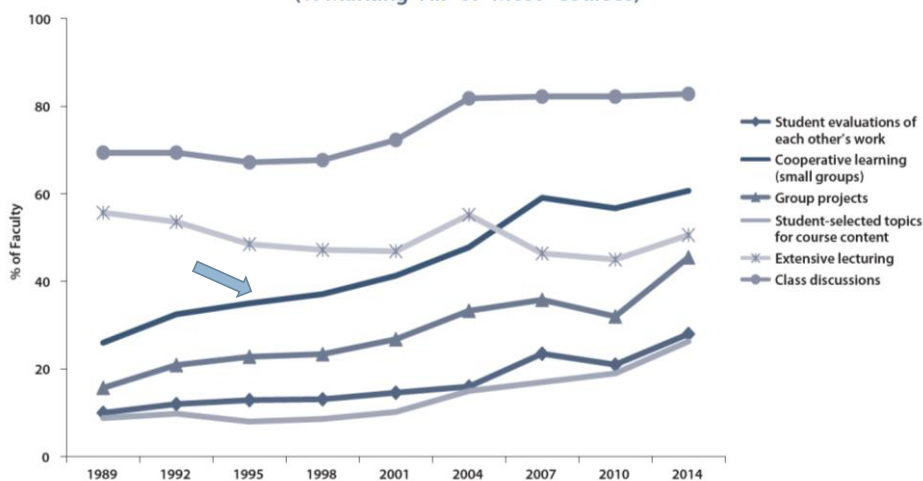
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Undergraduate Teaching Faculty: The 2013–2014 HERI Faculty Survey

Figure 2. Changes in Faculty Teaching Practices, 1989 to 2014
(% Marking "All" or "Most" Courses)



<http://heri.ucla.edu/monographs/HERI-FAC2014-monograph.pdf>

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Morrill Act – 1862 – MSU First Land Grant Institution

Like all land-grant institutions established under the Morrill Act's "grand experiment" in higher education, Michigan State faced a formidable mission:

- to democratize higher education and expand its opportunities based on merit, not social class
- to find practical applications for scientific research and technological innovations
- to make public service an essential part of higher education's mandate

<https://msu.edu/morrill-celebration/history.html>

MSU Guiding Principles – 1993

1. Improve ACCESS TO QUALITY Education and Expert Knowledge
2. **Achieve More ACTIVE LEARNING**
3. Generate New KNOWLEDGE AND SCHOLARSHIP Across the Mission
4. Promote PROBLEM SOLVING to Address Society's Needs
5. Advance DIVERSITY WITHIN COMMUNITY
6. Make PEOPLE MATTER

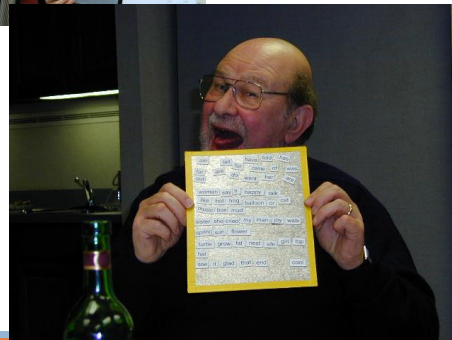


Cathy Bristow

MSU Lillies 1998-1999



MSU Lillies 1999-2000

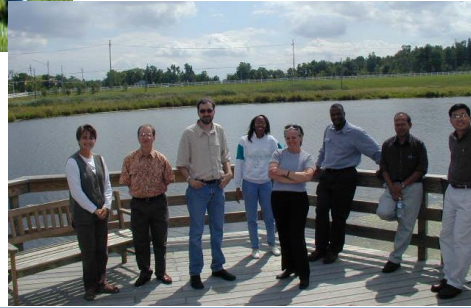




MSU Lillies 2000-2001



Don Straney – Assistant to the
Provost for Faculty Development
1995 – 2002



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Chancellor at University of Hawaii at Hilo

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Assistant Provost for Faculty and Organizational Development 2003 -



MSU Lilly Fellows – 2003-4

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Levels of inquiry in higher education

- **Level 0** Teacher
 - Teach as taught
- **Level 1** Effective Teacher
 - Teach using accepted teaching theories and practices
- **Level 2** Scholarly Teacher
 - Assesses performance and makes improvements
- **Level 3** Scholar of Teaching and Learning
 - Engages in educational experimentation, shares results
- **Level 4** Discipline-Based Education Researcher
 - Conducts educational research, publishes archival papers

Source: Streveler, R., Borrego, M. and Smith, K.A. 2007. Moving from the "Scholarship of Teaching and Learning" to "Educational Research:" An Example from Engineering. *Improve the Academy*, Vol. 25, 139-149.

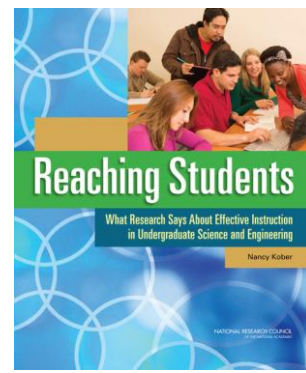
Discipline-Based Education Research (DBER)



National Research Council
Summer 2012 –
http://www.nap.edu/catalog.php?record_id=13362



ASEE Prism Summer 2013
Journal of Engineering Education – October, 2013

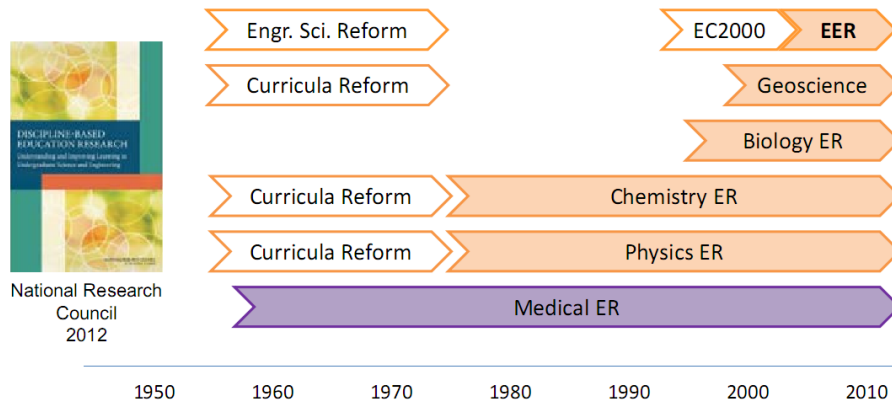


National Research Council – 2015
<http://www.nap.edu/catalog/18687/reaching-students-what-research-says-about-effective-instruction-in-undergraduate>

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Discipline-Based Education Research Timeline

DBER PhD Programs (xER)



DBER is **located** in the relevant disciplinary school, e.g. medicine, physics.



Global Impact Initiative
MICHIGAN STATE UNIVERSITY

Join Michigan State University's Global Impact Initiative, designed to address the grand challenges through the creation of over 100 new faculty positions in some of the most promising and exciting fields of research. We welcome applicants from diverse backgrounds. MSU offers an inclusive and collaborative work environment.

To learn more visit research.msu.edu/global-impact

College of Education

Open Rank, STEM Education

The College of Education, College of Natural Science, College of Engineering, and the Lyman Briggs College at Michigan State University seek a tenure-system faculty scholar at the associate or full professor level in STEM education. This position is part of an ongoing priority initiative in STEM education at MSU and, more broadly, the Global Impact Initiative to recruit leading scholars to the university. We are committed to strategically increasing our capacity to improve undergraduate education and to provide national leadership in STEM education by building on our long-standing record of excellence in research, graduate education, and teaching at the undergraduate level. The faculty in both mathematics and science education at MSU span several academic units and work collaboratively to address cross-university needs and work on pressing problems in the teaching and learning of science and mathematics at the college level.

Preference will be given to a full professor with a national reputation in improving STEM education at the undergraduate level. The successful candidate will have a tenure-system faculty position in the College of Education, College of Natural Science, College of Engineering or Lyman Briggs College, depending on which college and department most aligns with his/her area of expertise. A joint appointment across the colleges is possible. The successful candidate will also work within the Institute for Collaborative Research in Education, Assessment and Teaching Environments for the fields of Science, Technology, Engineering and Mathematics (CREATE for STEM), administered jointly by the College of Education and Natural Science, which provides support across the University to engage in collaborative research. The Institute was formed in 2010 with the goal of becoming a nationally recognized hub for research, policy and leadership in mathematics and science education. The Institute allows the building of unique collaborations among faculty in natural science and education to solve pressing problems in the teaching and learning of science and mathematics. Joint appointments and other cross-departmental and cross-college arrangements are possible.

Major responsibilities: The faculty member who assumes this position will provide leadership in STEM education, conduct research, and teach undergraduate, masters, and/or doctoral courses. The candidate will be expected to work collaboratively with other faculty throughout the university to conduct research and seek external funding to support research in improving STEM education at the undergraduate level. Additional duties will vary depending on departmental

MSU STEM Education Position



ILLINOIS STATE
UNIVERSITY
Illinois' first public university

Cross Endowed Chair in the Scholarship of Teaching and Learning (SoTL)

POSITION DESCRIPTION

THE POSITION

Title: Cross Endowed Chair in the Scholarship of Teaching and Learning

Illinois State University invites applications for the position of Cross Endowed Chair in the Scholarship of Teaching and Learning (SoTL). The endowed chair is named for K. Patricia "Pat" Cross who is the David Gardner Professor of Higher Education, Emerita at the University of California, Berkeley. She has also served as Dean of Students at Cornell University; Distinguished Research Scientist at Educational Testing Service; and Professor and Chair of the Department of Administration, Planning and Social Policy at the Harvard Graduate School of Education.

Integral to the mission of Illinois State University, the Cross Endowed Chair enhances innovation and research in teaching and learning, supports SoTL work on campus and beyond, increases Illinois State's ability to attract outstanding teacher-scholars to campus, and helps to establish a balance of recognition in scholarly work in teaching across disciplines. The Cross Endowed Chair also fosters opportunities for interaction and relationships with prestigious national forums related to SoTL. This is a university-level position reporting to the Office of the Provost. The Chair holds faculty rank in one of the University's academic colleges in order to promote the scholarship of teaching and learning across all disciplines and colleges. The University is organized into six academic colleges: Applied Science and Technology, Arts & Sciences, Business, Education, Fine Arts, and Nursing.

The Cross Endowed Chair for the Scholarship of Teaching and Learning shall be evaluated annually by the Associate Vice President for Research and Graduate Studies. The purpose of the annual review is formative; it also provides a comparative basis for the award of merit-based salary increases, if available.

KEY RESPONSIBILITIES OF THE CROSS ENDOWED CHAIR

The Cross Endowed Chair provides the opportunity for scholarship on teaching and learning in the discipline of the Chair, and also serves as a resource, related to SoTL, to colleagues on and off the campus of Illinois State University. The Cross Chair receives resources to support their own SoTL work and to assist in the development of faculty SoTL research, including items such as research time, clerical and research assistance, and travel sufficient to support a national research agenda and reputation. The Cross Endowed Chair works collaboratively with the Center for Teaching, Learning and Technology; University Assessment Services; national and international SoTL organizations; and faculty colleagues on teaching.

The position also carries teaching responsibilities. The teaching requirements may vary at times as negotiated by the Associate Vice President for Research & Graduate Studies, the appropriate Dean, and the Cross Chair,

Cross Endowed Chair in SoTL



CORPS
NSF Innovation Corps

Innovation Corps for Learning (I-Corps-L): Evidence-based Entrepreneurship™ to Improve (STEM) Education

Principal Investigator: Karl Smith, Ph.D.



"Enacting educational transformation by taking an entrepreneurial approach"



Team 9: Carpel Coding
"Helping you Make Things"

What is I-Corps™ L?

The Innovation Corps for Learning (I-Corps™ L) is an initiative to propagate and scale educational innovations sponsored by the National Science Foundation (NSF) and Intel. I-Corps™ L is modeled on the NSF I-Corps™ program, which helps research scientists and engineers develop the enterprise skills needed to turn laboratory discoveries into commercial ventures.

"I think the program's content elements, i.e., a scientific approach to customer discovery framed within the construct of the business model canvas) provide a potentially transformative perspective to propagation of innovations."

24 new teams will begin their I-Corps™ L Learning Journey in summer 2016



I-Corps for Learning

The overarching goal of I-Corps™ L is to foster an entrepreneurial mindset within the education community to impact the way innovations are designed and implemented.

Program Overview

Teams embark upon the eight week program. Each team comprised of three to four members, including a principal investigator, an entrepreneurial lead, and a mentor. I-Corps™ L teams receive support in the form of mentoring and funding to accelerate the learning that helps successfully scaled innovation in a sustainable manner.



I-Corps™ L
Teaching Team

"Having to conduct so many interviews was incredibly helpful. As we ran out of people to talk to, we were forced to get opinions from people we wouldn't have normally thought to talk to."

56 teams have completed the I-Corps™ L Learning process

Lean Startup Method

Used to search for a sustainable and scalable model

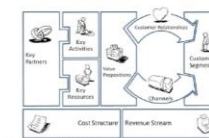
Key Features:

Hypothesis testing using a **business-modeling** tool, the Business Model Canvas (BMC)

"Get out of the building" using **customer development** to test your hypothesis

Based on customer feedback, **agile development** to rapidly iterate your innovation (product or concept) to design/build something users would adopt.

Business Model Canvas (BMC)



I-Corps project is funded by the National Science Foundation under grant NSF DUE-1300391, DUE-1300431, DUE-1400444, and DUE-1401240



Embracing the *WORLD GRANT IDEAL*



Affirming the
Morrill Act
for a
Twenty-first-century
Global Society

Lou Anna Kimsey Simon
President

MICHIGAN STATE
UNIVERSITY

